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(54) Device For Heat Exchange

(57)

The invention pertains to a flow channel, which is provided with built in accessories and which, especially in the case of highly viscous fluids, substantially improves the exchange of heat and allows the construction of a smaller apparatus. The device according to the invention for the exchange of heat in a flow channel for flowing media has, according to Figure 1, at least one mixing insert (1,2,3,4) with one integrated pipe bundle (15). The mixing inserts (1,2,3,4) have 4 web plates (7,8) reaching through while intersecting and 8 shortened intersecting web plates (9,10,11,12). The ratio between the maximum web width (x) and the pipe

diameter (Di) is 0.25, and the ratio between the length (L) of a mixing element and the pipe diameter (Di) is 0.8 to 1.2, and the angle of the web plates with reference to the pipe axis is 42° to 48°. Additionally, the ratio between the distance (y) in each mixing insert (1,2,3,4) and the pipe diameter (Di) has a value of 0.2 to 0.4. The mixing inserts (1,2,3,4) are arranged in the flow channel in series, the elements that are adjacent to each other being rotationally transposed against each other by an angle of 90° with reference to the pipe axis. The mixing inserts possess ellipses, into which at least one pipe (5,6) is

pushed in the form of a pipe bundle (15) and attached to the mixing insert.

Figure 1

Description

[0001] The invention pertains to a flow channel which is provided with built in accessories and which, especially in the case of highly viscous fluids, substantially improves the exchange and allows the construction of a compact heat exchanger. Such devices are, for instance, known from Letters Patent DE 28 08 854 C3. This device mixes primarily the material stream and is called "static mixer" in habitual linguistic usage. The redirection of the material streams causes an improvement of the heat transfer at the pipe wall. But the dual jacket design becomes very long, and the pressure loss correspondingly high. Increasingly, static mixers are also used in pipe bundle heat exchangers, wherein the highly viscous fluid flows through the many small pipes in each case. As a result of the plurality of the pipes, it is, however, not possible to provide any safe information regarding the dwell time spectrum.

[0002] The object of the invention is designing a channel with built in accessories in such a way that the highly viscous material stream flows in the jacket space of a specially arranged pipe bundle and that, in the pipe bundle, static mixers are placed, which assure continuous surface renewal at the pipe bundle and at the pipe wall.

[0003] The specified objective is accomplished in accordance with the invention by the characterizing features of the claims.

[0004] In the Claims, the exemplary embodiment is explained in greater detail, based on the drawings, showing in

Fig. 1 a three-dimensional presentation of four mixing elements with pipe bundles.

[0005] The device according to the invention for the exchange of heat in a flow channel for

flowing media has, according to Figure 1, at least one mixing insert (1,2,3,4) with one integrated pipe bundle (15). The mixing inserts (1,2,3,4) have 4 web plates (7,8) reaching through while intersecting and 8 shortened intersecting web plates (9,10,11,12). The ratio between the maximum web width (x) and the pipe diameter (D_i) is 0.25, and the ratio between the length (L) of a mixing element and the pipe diameter (D_i) is 0.8 to 1.2, and the angle of the web plates with reference to the pipe axis is 42° to 48° . Additionally, the ratio between the perpendicular distance (y) in each mixing insert (1,2,3,4) and the pipe diameter (D_i) has a value of 0.2 to 0.4. The mixing inserts (1,2,3,4) are arranged in the flow channel in series, the elements that are adjacent to each other being rotationally transposed against each other by an angle of 90° with reference to the pipe axis. The mixing inserts possess ellipses, into which at least one pipe (5,6) is pushed in the form of a pipe bundle (15) and attached to the mixing insert.

Claims

1. Device for the exchange of heat according to Fig. 1, **characterized in that**, in a flow channel, at least one mixing insert (1,2,3,4) has at least 4 web plates (7,8) reaching through while intersecting, and 8 shortened intersecting web plates (9,10,11,12), and that the ratio between the maximum web width (x), and the pipe diameter (D_i) is 0.25, and that the ratio between the length (L) and the pipe diameter (D_i) is 0.8 to 1.2, and that the angle of the web plates with reference to the pipe axis is 42° to 48° , and that the ratio between the perpendicular web distance (y), and the pipe diameter (D_i) has a value of 0.2 to 0.4, and that the mixing inserts possess ellipses, into which at least one pipe (5,6) is pushed in the

form of a pipe bundle and attached to the mixing insert.

2. Device for the exchange of heat in accordance with Claim 1, **characterized in that** the mixing inserts (1,2,3,4) are arranged in the flow channel in series, the mixing inserts (1,2,3,4) that are adjacent to each other being rotationally transposed against each other by an angle of 90° with reference to the pipe axis.
3. Device for the exchange of heat according to Claim 1, **characterized in that** the mixing inserts (1,2,3,4) are arranged in the flow channel in series with pipe distances of a maximum of three times the length (L), the mixing inserts (1,2,3,4) after the empty pipe distance being rotationally transposed against each other by an angle of 90° .
4. Device for the exchange of heat according to Claim 1, **characterized in that** the mixing inserts (1,2,3,4) have a maximum of 8 web plates (7,8) reaching through while intersecting and a maximum of 16 shortened intersecting web plates (9,10,11,12). The ratios between the perpendicular web width (x) and the pipe diameter (D_i) are appropriately adapted.
5. Device for the exchange of heat according to Claim 1, **characterized in that** the pipes of the pipe bundle (15) can be freely positioned.
6. Device for the exchange of heat according to Claim 1. **characterized in that** the mixing units are soldered to the pipe bundle.

Figur 1

PERTINENT DOCUMENTS			
Category	Identification of Document Including, to the Extent Required, the Relevant Portions	Re Claim	APPLICATION CLASS (Intl.Cl.7)
A	DE 24 10 292 A (CASS INTERNATIONAL GMBH) September 18, 1975 (1975-09-18) * Claims; Figures 2,3 *	1-6	F28F9/22 F28F13/06 B02F5/06
A, D	DE 28 08 854 A (GEBRÜDER SULZER AG) January 4, 1979 (1979-01-04) * Claims; Figures *	1	SEARCH REPORT SUBJECT AREA (INTL.CL.7)
			F28F B01F
The search report herein was drawn up for all the claims.			
Search Location BERLIN		Conclusion of Search October 30, 2000	Examiner Cordero Alvarez, M
CATEGORIES OF PUBLICATIONS CITED: X: Of special significance when considered on its/their own Y: Of special significance in conjunction with another publication of the same category. A: Technological background O: Non-written disclosure P: Intermediate publication		T: Theories or principles on which invention is based E: Older patent document published on or after application date D: Document cited in the application L: Document cited for other reason &: Publication that is a member of the same patent family, identical publication.	

ANNEX TO THE EUROPEAN SEARCH REPORT
CONCERNING EUROPEAN PATENT APPLICATION NO. EP 00 81 0566

This Annex contains the members of the patent families of the patent documents listed in the above-stated European search report.

The information concerning the family members corresponds to the status of the file of the European Patent Office on

This information is only provided for information purposes and without any guarantee. Oct. 30, 2000

Patent Documents Cited in Search Report	Date of Publication	Member(s) of Patent Family	Date of Publication
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Regarding further details related to this Annex: See European Patent Office Gazette No. 12/82
[on the margin: EPO Form PC461]

Translator's Notes:

Typo German Column 1, Line 24: "das" must be assumed to be "dass" or the second part of the sentence makes no sense (as written, grammatically, it would make the German word "Mischer" neuter in gender--article "das", while in reality it is masculine--article "der", plural for both "die".)

Figur 1

